FIG. 1

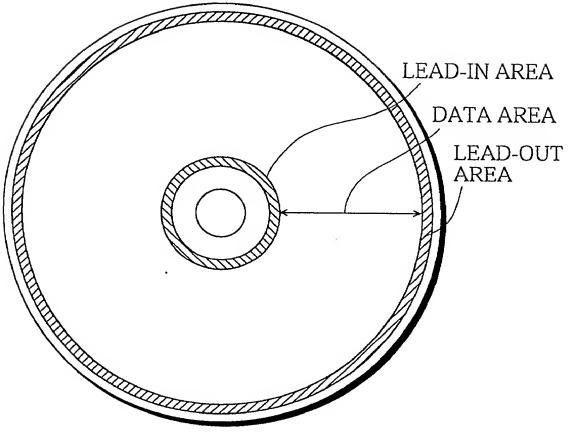


FIG. 2

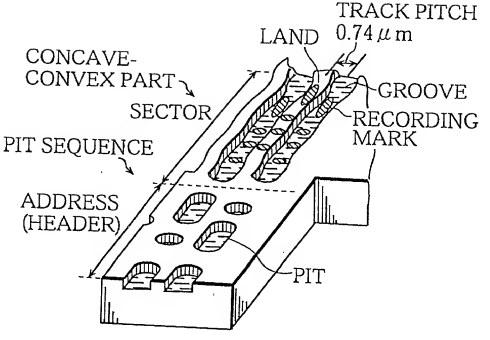

TRACK PITCH
0.74 μm
LAND
CONCAVE-
CONVEX PART
SECTOR
GROOVE
RECORDING
MARK
PIT SEQUENCE
ADDRESS
(HEADER)
PIT

FIG. 3A

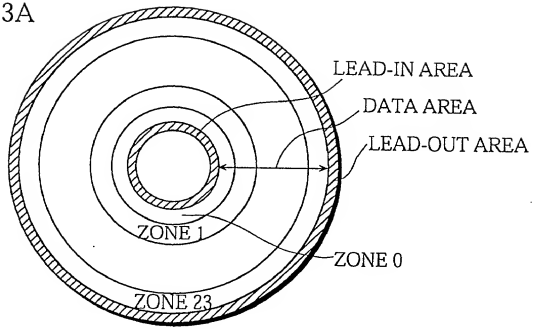


FIG. 3B

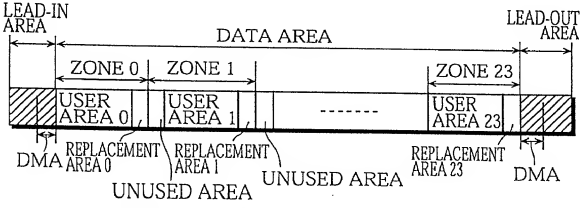


FIG. 3C

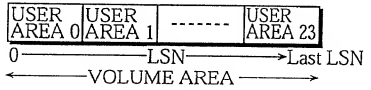


FIG. 3D

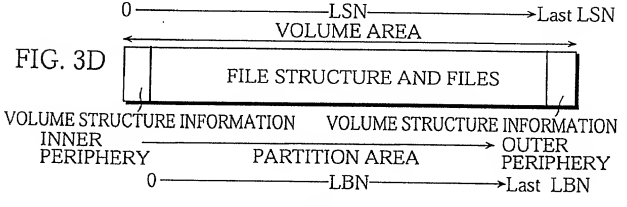


FIG. 4

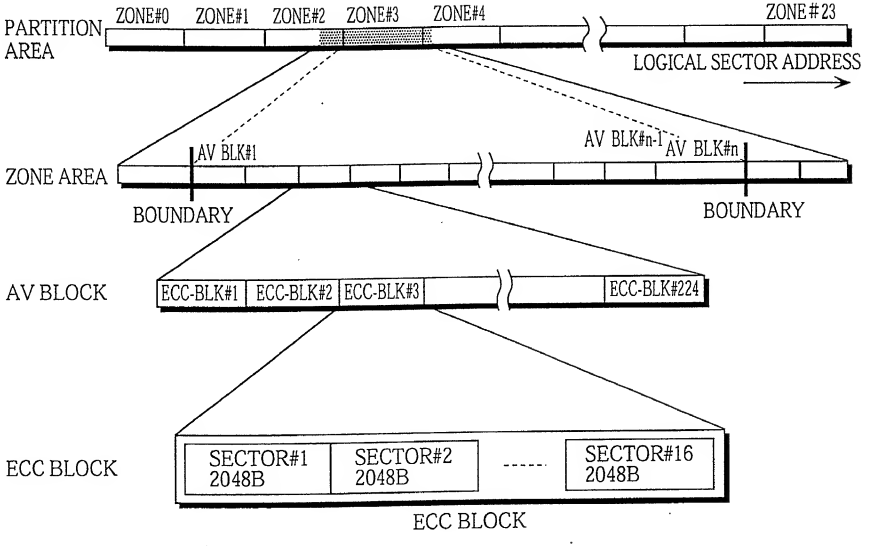

PARTITION AREA
ZONE#0
ZONE#1
ZONE#2
ZONE#3
ZONE#4
ZONE#23
LOGICAL SECTOR ADDRESS
ZONE AREA
AV BLK#1
AV BLK#n-1
AV BLK#n
BOUNDARY
BOUNDARY
AV BLOCK
ECC-BLK#1
ECC-BLK#2
ECC-BLK#3
ECC-BLK#224
ECC BLOCK
SECTOR#1 2048B
SECTOR#2 2048B
SECTOR#16 2048B
ECC BLOCK

FIG. 5

LAST BLOCK-LENGTH TABLE

ZONE NUMBER	NUMBER OF ECC-BS	LAST LBN
1	272	
2	304	
3	315	
4	293	
	⋮	
i	FL(i)	
	⋮	

FIG. 6

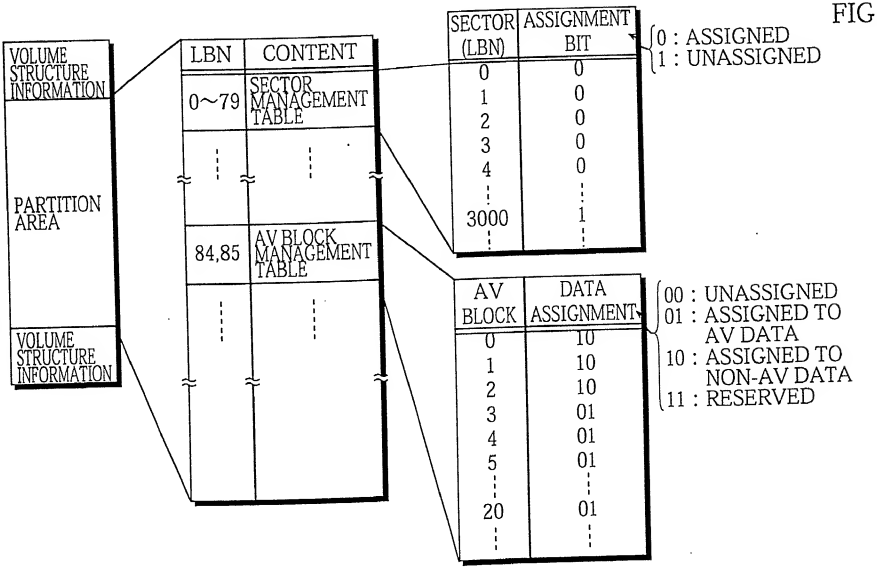

VOLUME STRUCTURE INFORMATION
PARTITION AREA
VOLUME STRUCTURE INFORMATION
LBN
CONTENT
0~79
SECTOR MANAGEMENT TABLE
84,85
AV BLOCK MANAGEMENT TABLE
SECTOR (LBN)
ASSIGNMENT BIT
0 : ASSIGNED
1 : UNASSIGNED
0
1
2
3
4
3000
AV BLOCK
DATA ASSIGNMENT
00 : UNASSIGNED
01 : ASSIGNED TO AV DATA
10 : ASSIGNED TO NON-AV DATA
11 : RESERVED
10
01
20

FIG. 7

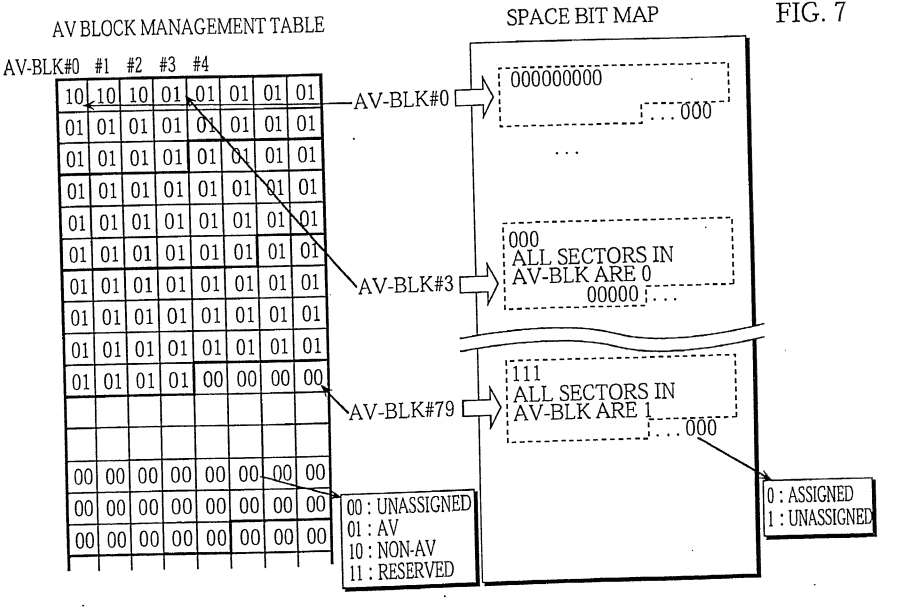

AV BLOCK MANAGEMENT TABLE
AV-BLK#0 #1 #2 #3 #4
AV-BLK#0
AV-BLK#3
AV-BLK#79
SPACE BIT MAP
000000000
...000
000
ALL SECTORS IN
AV-BLK ARE 0
00000...
111
ALL SECTORS IN
AV-BLK ARE 1
...000
00 : UNASSIGNED
01 : AV
10 : NON-AV
11 : RESERVED
0 : ASSIGNED
1 : UNASSIGNED

FIG. 8

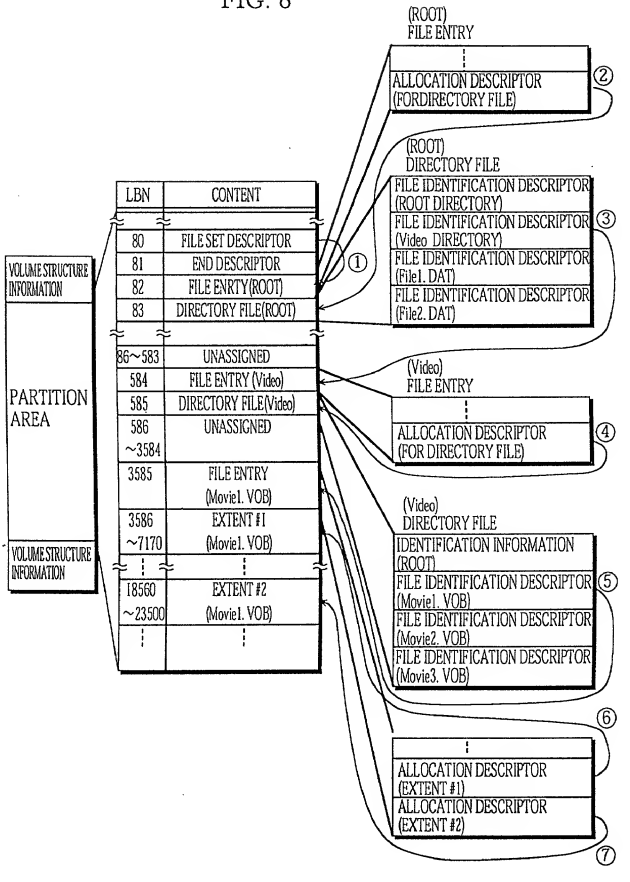


FIG. 9

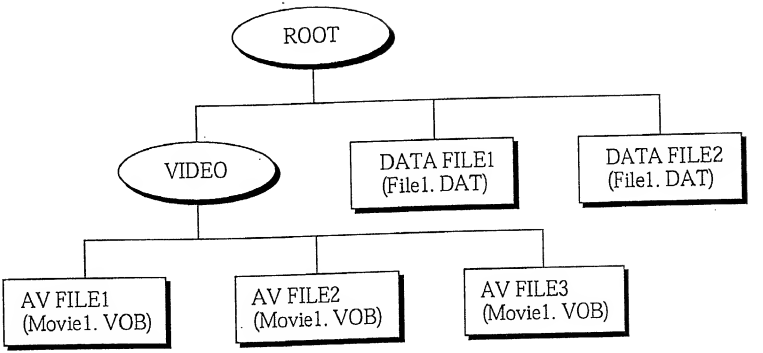

ROOT
VIDEO
DATA FILE1
(File1. DAT)
DATA FILE2
(File1. DAT)
AV FILE1
(Movie1. VOB)
AV FILE2
(Movie1. VOB)
AV FILE3
(Movie1. VOB)

FIG. 10

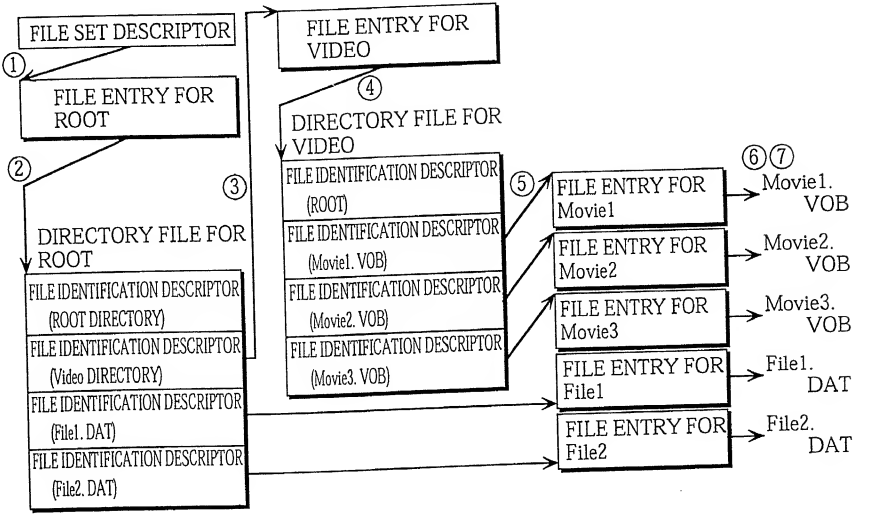

FILE SET DESCRIPTOR
①
FILE ENTRY FOR ROOT
②
DIRECTORY FILE FOR ROOT
FILE IDENTIFICATION DESCRIPTOR (ROOT DIRECTORY)
FILE IDENTIFICATION DESCRIPTOR (Video DIRECTORY)
FILE IDENTIFICATION DESCRIPTOR (File1. DAT)
FILE IDENTIFICATION DESCRIPTOR (File2. DAT)
③
FILE ENTRY FOR VIDEO
④
DIRECTORY FILE FOR VIDEO
FILE IDENTIFICATION DESCRIPTOR (ROOT)
FILE IDENTIFICATION DESCRIPTOR (Movie1. VOB)
FILE IDENTIFICATION DESCRIPTOR (Movie2. VOB)
FILE IDENTIFICATION DESCRIPTOR (Movie3. VOB)
⑤
FILE ENTRY FOR Movie1
FILE ENTRY FOR Movie2
FILE ENTRY FOR Movie3
FILE ENTRY FOR File1
FILE ENTRY FOR File2
⑥⑦
Movie1. VOB
Movie2. VOB
Movie3. VOB
File1. DAT
File2. DAT

FIG. 11A

FILE ENTRY

BP	LENGTH	FIELD NAME	CONTENT
0	16	DESCRIPTOR TAG	tag
16	20	ICB TAG	icbtag
..	..	..	..
172	4	ALLOCATION DESCRIPTOR LENGTH	Unit32
176	L-EA	EXTENSION ATTRIBUTE	BYTE
a	L-AD	ALLOCATION DESCRIPTOR	BYTE

ALLOCATION DESCRIPTOR FIELD IN FILE ENTRY

RBP	LENGTH	CONTENT
0	8	ALLOCATION DESCRIPTOR : EXTENT A
16	8	ALLOCATION DESCRIPTOR : EXTENT B
24	8	ALLOCATION DESCRIPTOR : EXTENT C
32	8	ALLOCATION DESCRIPTOR : EXTENT D

ALLOCATION DESCRIPTOR LENGTH=L-AD, EXTENSION ATTRIBUTE LENGTH=L-EA, a=L-EA+176

FIG. 11B

ALLOCATION DESCRIPTOR

RBP	LENGTH	FIELD NAME	CONTENT
0	4	EXTENT LENGTH	Unit32
4	4	EXTENT POSITION	Unit32

FIG. 11C

INTERPRETATION OF UPPER TWO BITS OF EXTENT LENGTH OF ALLOCATION DESCRIPTOR(NON-AV FILE)

VALUE	INTERPRETATION
0	ASSIGNED AND RECORDED EXTENT
1	ASSIGNED AND NOT-RECORDED EXTENT
2	RESERVED
3	EXTENT AS EXTENSION OF ALLOCATION DESCRIPTOR

FIG. 12A

FILE IDENTIFICATION DESCRIPTOR FOR DIRECTORY

MANAGEMENT INFORMATION
IDENTIFICATION INFORMATION(DIRECTORY)
DIRECTORY NAME LENGTH
FILE ENTRY ADDRESS
INFORMATION FOR EXTENSION
DIRECTORY NAME

FIG. 12B

FILE IDENTIFICATION DESCRIPTOR FOR FILE

MANAGEMENT INFORMATION
IDENTIFICATION INFORMATION(FILE)
DIRECTORY NAME LENGTH
FILE ENTRY ADDRESS
INFORMATION FOR EXTENSION
FILE NAME

FIG. 13

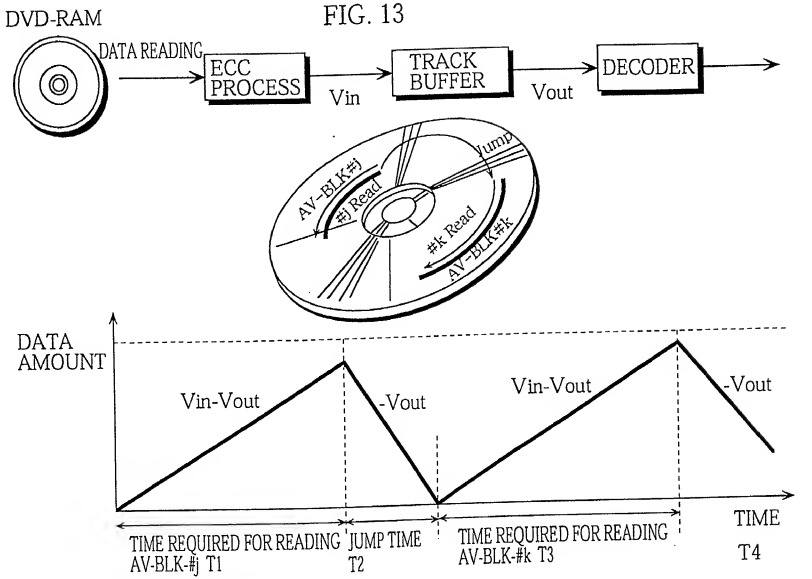

DVD-RAM
DATA READING
ECC PROCESS
Vin
TRACK BUFFER
Vout
DECODER
AV-BLK-#j
#j Read
Jump
#k Read
AV-BLK-#k
DATA AMOUNT
Vin-Vout
-Vout
Vin-Vout
-Vout
TIME
TIME REQUIRED FOR READING AV-BLK-#j T1
JUMP TIME T2
TIME REQUIRED FOR READING AV-BLK-#k T3
T4

FIG. 14

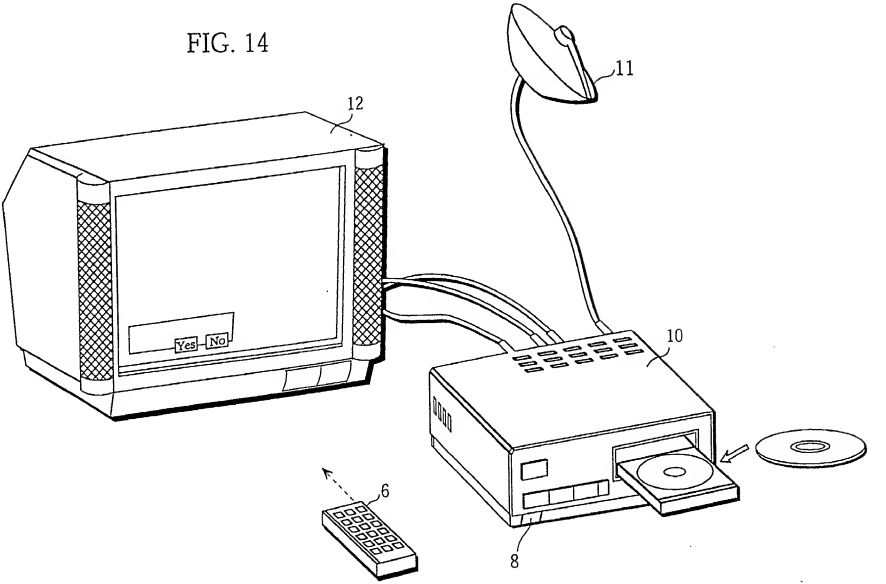


FIG. 15

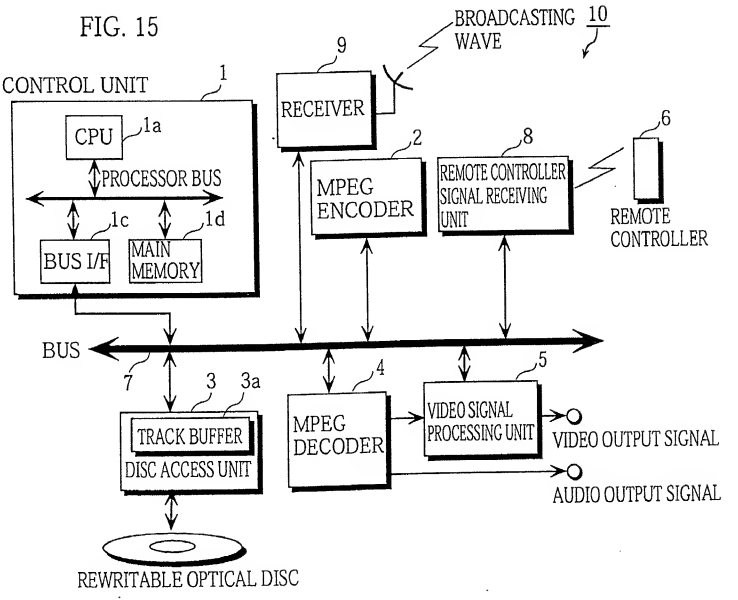

BROADCASTING WAVE
10
9
RECEIVER
CONTROL UNIT
1
CPU
1a
PROCESSOR BUS
1c
1d
BUS I/F
MAIN MEMORY
2
MPEG ENCODER
8
REMOTE CONTROLLER SIGNAL RECEIVING UNIT
6
REMOTE CONTROLLER
BUS
7
3
3a
TRACK BUFFER
DISC ACCESS UNIT
4
MPEG DECODER
5
VIDEO SIGNAL PROCESSING UNIT
VIDEO OUTPUT SIGNAL
AUDIO OUTPUT SIGNAL
REWRITABLE OPTICAL DISC

FIG. 16

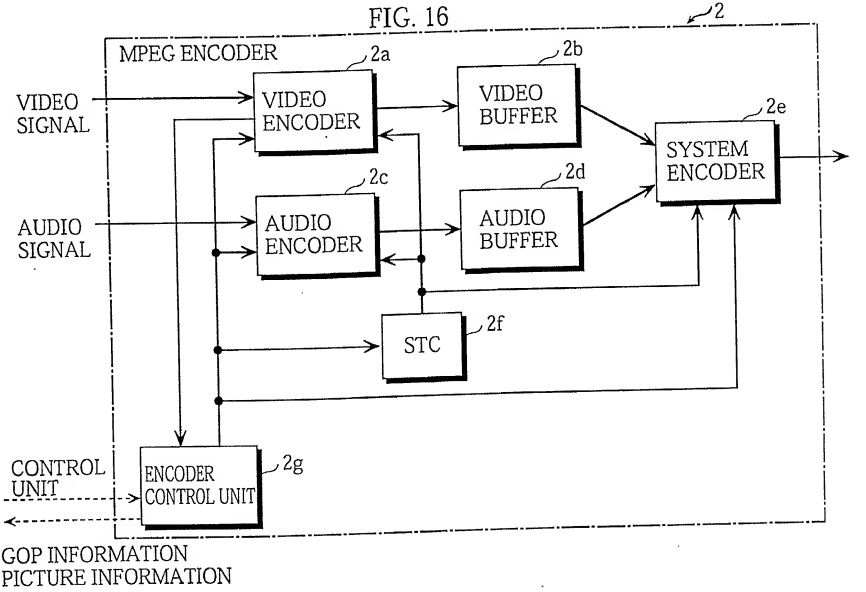

2
MPEG ENCODER
2a
2b
VIDEO SIGNAL
VIDEO ENCODER
VIDEO BUFFER
2e
SYSTEM ENCODER
2c
2d
AUDIO SIGNAL
AUDIO ENCODER
AUDIO BUFFER
STC
2f
CONTROL UNIT
ENCODER CONTROL UNIT
2g
GOP INFORMATION
PICTURE INFORMATION

FIG. 17

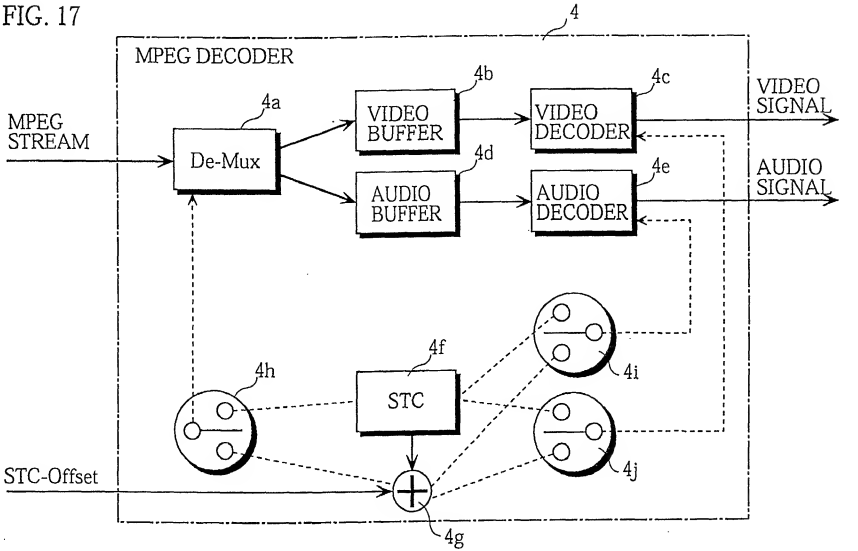

4
MPEG DECODER
MPEG STREAM
4a
De-Mux
4b
VIDEO BUFFER
4c
VIDEO DECODER
VIDEO SIGNAL
4d
AUDIO BUFFER
4e
AUDIO DECODER
AUDIO SIGNAL
4f
STC
4h
4i
4j
STC-Offset
4g

FIG. 18

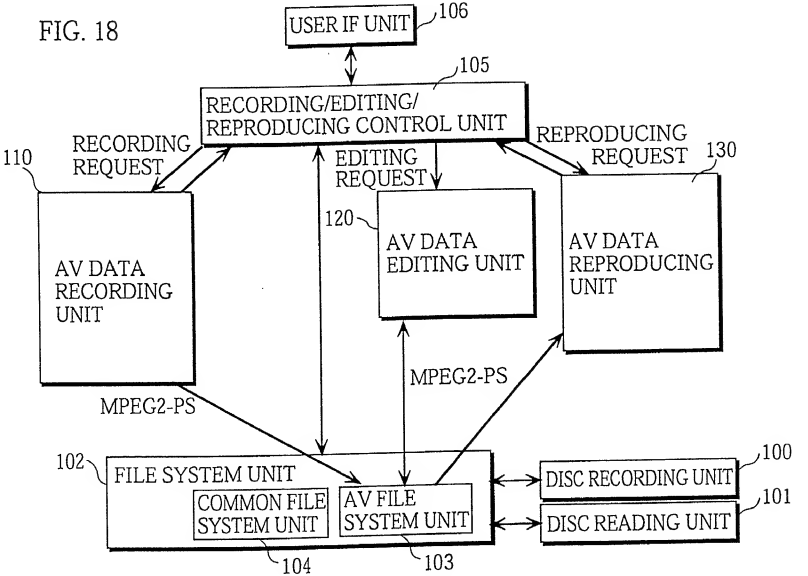

USER IF UNIT
106
105
RECORDING/EDITING/
REPRODUCING CONTROL UNIT
RECORDING
REQUEST
110
EDITING
REQUEST
REPRODUCING
REQUEST
130
120
AV DATA
RECORDING
UNIT
AV DATA
EDITING UNIT
AV DATA
REPRODUCING
UNIT
MPEG2-PS
MPEG2-PS
102
FILE SYSTEM UNIT
COMMON FILE
SYSTEM UNIT
AV FILE
SYSTEM UNIT
104
103
DISC RECORDING UNIT
100
DISC READING UNIT
101

FIG. 19

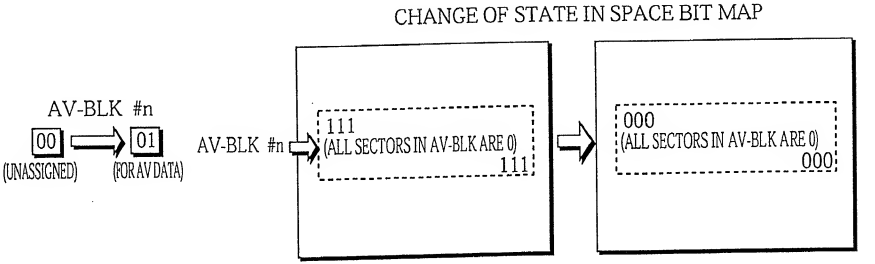

CHANGE OF STATE IN SPACE BIT MAP
AV-BLK #n
00
(UNASSIGNED)
01
(FOR AV DATA)
AV-BLK #n
111
(ALL SECTORS IN AV-BLK ARE 0)
111
000
(ALL SECTORS IN AV-BLK ARE 0)
000

FIG. 20

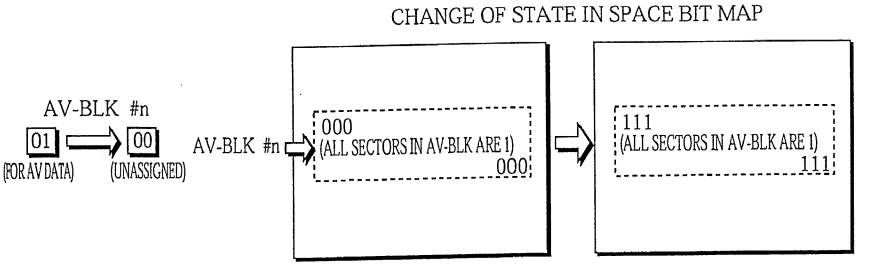

CHANGE OF STATE IN SPACE BIT MAP
AV-BLK #n
01
00
(FOR AV DATA)
(UNASSIGNED)
AV-BLK #n
000
(ALL SECTORS IN AV-BLK ARE 1)
000
111
(ALL SECTORS IN AV-BLK ARE 1)
111

FIG. 21

COMMON FILE SYSTEM UNIT

CREATE	GENERATE A FILE
DELTE	DELETE A FILE
OPEN	OPEN A FILE
CLOSE	CLOSE A FILE
WRITE	WRITE A NON-AV FILE
READ	READ A FILE(COMMON TO AV AND NON-AV)
SEEK	MOVE INSIDE A DATA STREAM
RENAME	CHANGE A FILE NAME
MKDIR	GENERATE A DIRECTORY
RMDIR	REMOVE A DIRECTORY
STATFS	OBTAIN A FILE SYSTEM STATE
GET-ATTR	OBTAIN A FILE ATTRIBUTE
SET-ATTR	SET A FILE ATTRIBUTE

AV FILE SYSTEM UNIT

AV-WRITE	WRITE AN AV FILE
MERGE	MERGE OF AVFILE1+BUFFER+AV FILE2
SPLIT	SPLIT AN AV FILE
SHORTEN	DELETE AN EDGE OF AV FILE
REPLACE	REPLACE A PART OF AV FILE
SEARCH-DISCON	DETECT WHETHER A SPECIFIED SECTION INCLUDES A DISCONTINUOUS BOUNDARY(ZONE BOUNDARY)

FIG. 22

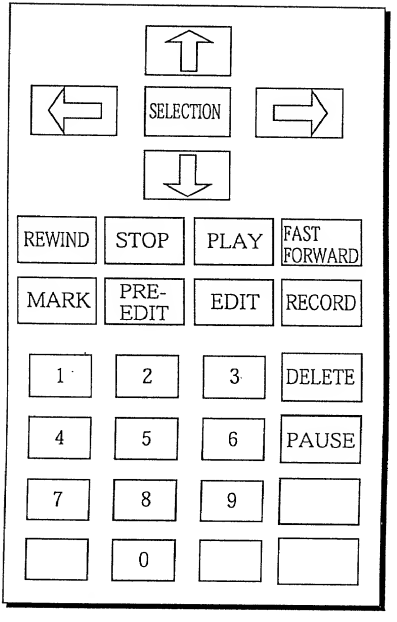

SELECTION
REWIND
STOP
PLAY
FAST FORWARD
MARK
PRE-EDIT
EDIT
RECORD
1
2
3
DELETE
4
5
6
PAUSE
7
8
9
0

FIG. 23

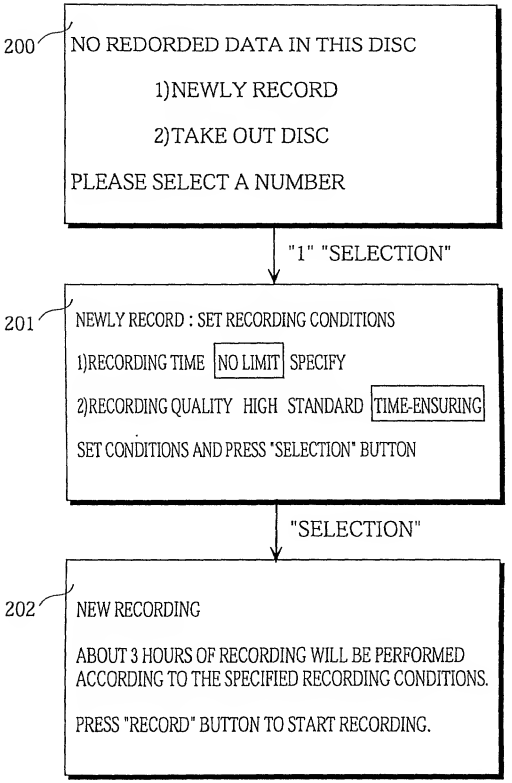


FIG. 24

RECORDING CONDITION	SETTING BY AV DATA INPUT UNIT
HIGH QUALITY	BIT RATE=6Mbps,RESOLUTION=720×480
STANDARD	BIT RATE=3Mbps,RESOLUTION=360×480
TIME-ENSURING	BIT RATE=1.5Mbps,RESOLUTION=360×240

FIG. 25A

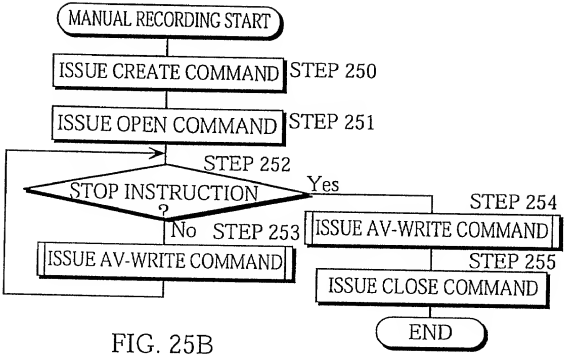


FIG. 25B

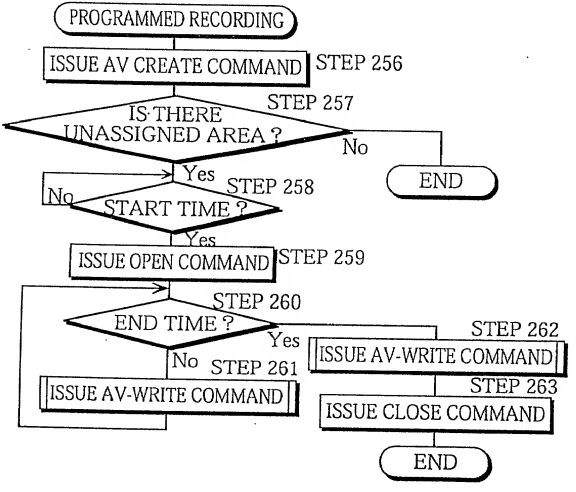


FIG. 26

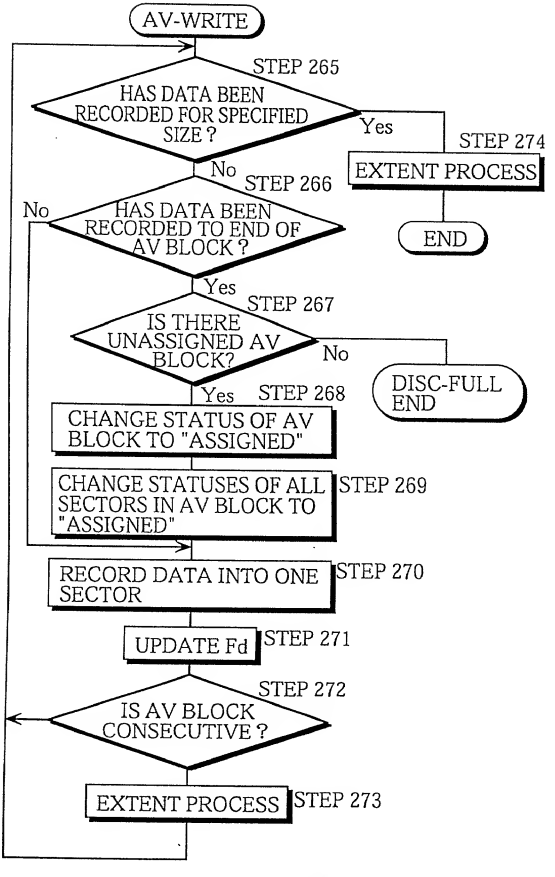


FIG. 27

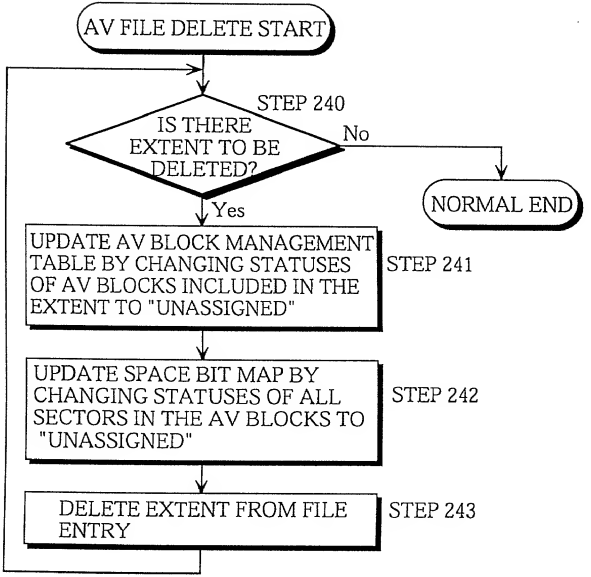

AV FILE DELETE START
STEP 240
IS THERE EXTENT TO BE DELETED?
No
NORMAL END
Yes
UPDATE AV BLOCK MANAGEMENT TABLE BY CHANGING STATUSES OF AV BLOCKS INCLUDED IN THE EXTENT TO "UNASSIGNED"
STEP 241
UPDATE SPACE BIT MAP BY CHANGING STATUSES OF ALL SECTORS IN THE AV BLOCKS TO "UNASSIGNED"
STEP 242
DELETE EXTENT FROM FILE ENTRY
STEP 243

FIG. 28A

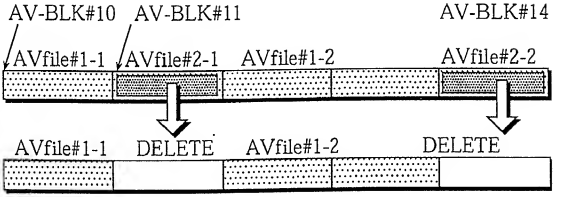


FIG. 28B

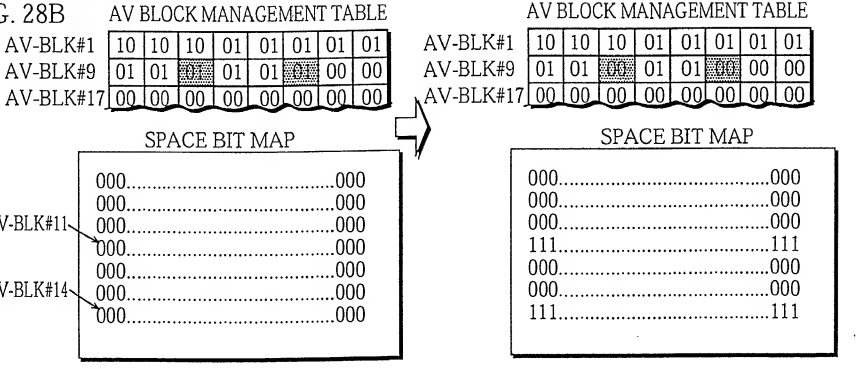


FIG. 29

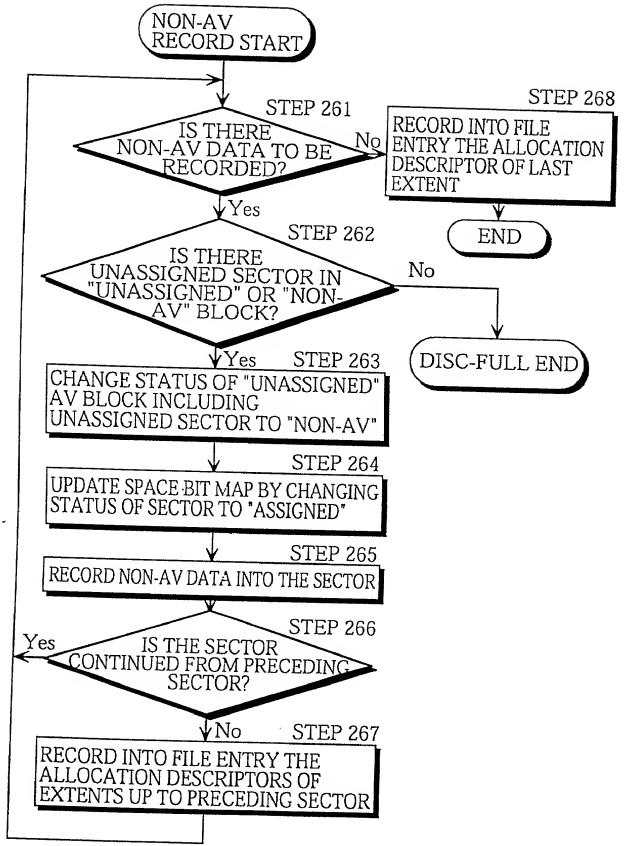


FIG. 30

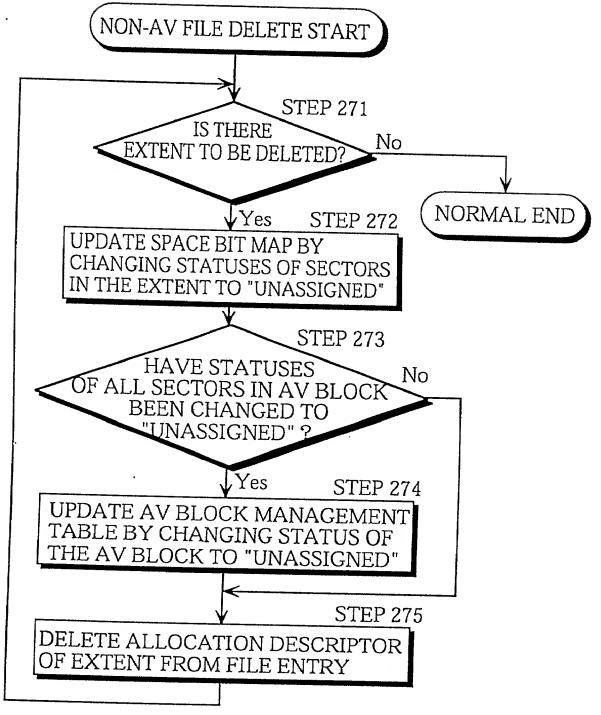


FIG. 31A

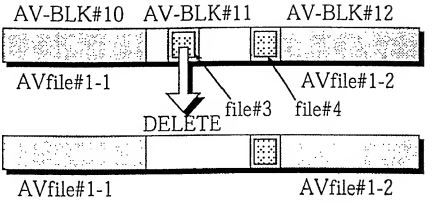


FIG. 31B

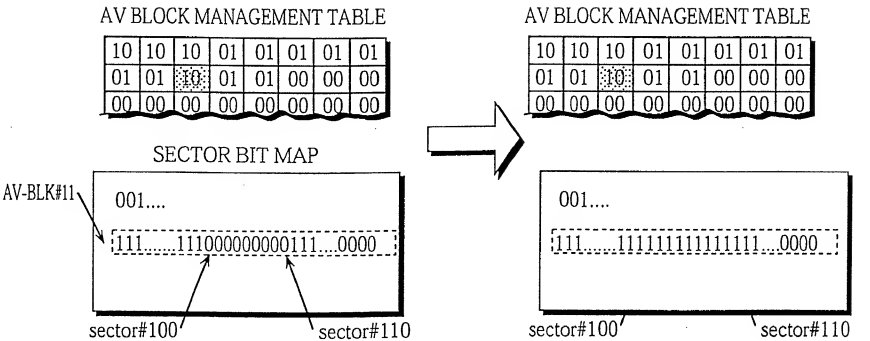


FIG. 32

AV BLOCK MANAGEMENT TABLE

20E0	20E0	20E0	10E0	10E0	10DF	10E0	10E0
10E0	10E0	10E0	10E0	10E0	10E0	10E0	10E0
10E0	10E0	10E0	11I0	10E0	10E0	10E0	10E0
10E0	10E0	10E0	10DD	10E0	10DC	10E0	10E0
10E0	10E0	10E0	10E0	10E0	10E0	10E0	10E0
10E0	10E0	10E0	10E0	10E0	1130	10E0	10E0
10E0	10E0	10E0	10E0	10E0	10E0	10E0	10E0
10E0	10E0	10E0	10DF	10E0	10E0	10DF	10E0
10E0	10E0	10E0	10E0	10E0	10E0	10E0	10E0
10E0	10E0	10E0	10E0	10DE	1138	10E0	10E0
10E0	10E0	10DF	10E0	10E0	10E0	10DE	10E0
10E0	10E0	10E0	00E0	00E0	00E0	00E0	00E0
00E0	00E0	00E0	00E0	00E0	00E0	00E0	00E0
00E0	00E0	00E0	00E0	00E0	00E0	00E0	00E0
00E0	00E0	00E0	00E0	00E0	00E0	00E0	00E0
00E0	00E0	00E0	00E0	00E0	00E0	00E0	01BB

DATA STRUCTURE OF AV BLOCK MANAGEMENT TABLE

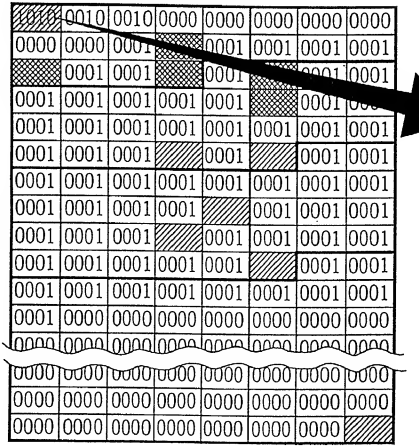
0010 0000 1110 0000

4bit～15bit
AV BLOCK SIZE
(THE NUMBER OF ECC BLOCKS)
0～4095

0bit～3bit
AV BLOCK ATTRIBUTE INFORMATION
0000 UNASSIGNED
0001 AV
0010 NON-AV
0011 ～ 1111 RESERVED

FIG. 33

AV BLOCK MANAGEMENT TABLE



DATA STRUCTURE OF AV BLOCK MANAGEMENT TABLE AV BLOCK SIZE

X000	UNASSIGNED
X001	AV
X010	NON-AV
X011 ~ X111	RESERVED
0XXX	FIXED-LENGTH BLOCK
1XXX	VARIABLE-LENGTH BLOCK

VARIABLE-LENGTH AV BLOCK TABLE

BLOCK NUMBER	AV BLOCK LENGTH
1	223
12	222
17	222
20	272
22	221
i	FL(i)

FIG. 34

AV BLOCK MANAGEMENT TABLE

2010	2024	203f	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
1001	1001	1001	1001	1001	1001	1001	1001
0000	0000	0000	0000	0000	0000	0000	0000
0000	0000	0000	0000	0000	0000	0000	0000
0000	0000	0000	0000	0000	0000	0000	0000
0000	0000	0000	0000	0000	0000	0000	0000
0000	0000	0000	0000	0000	0000	0000	0000
0000	0000	0000	0000	0000	0000	0000	0000

DATA STRUCTURE OF AV BLOCK MANAGEMENT TABLE

0010 0000 0001 0000

4bit～15bit
FILE COUNTER
0～4095

0bit～3bit
AV BLOCK ATTRIBUTE INFORMATION
0000 UNASSIGNED
0001 AV
0010 NON-AV
0011 ～ 1111 RESERVED

FIG. 35

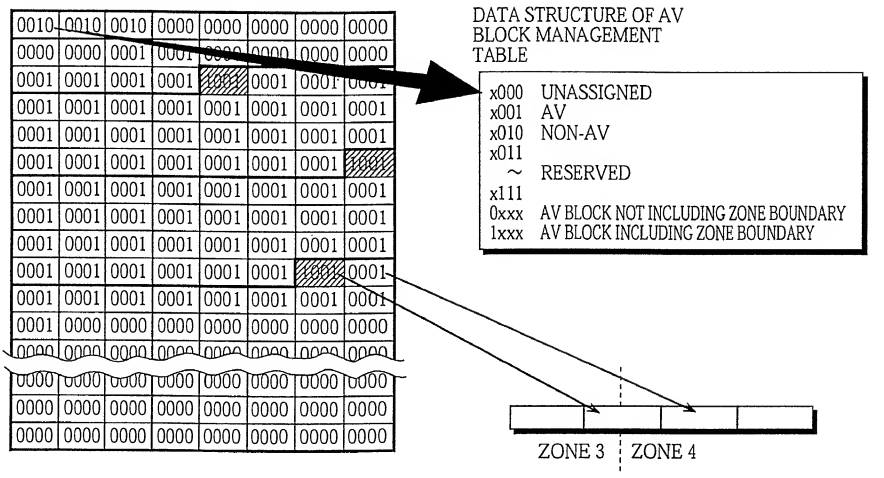

AV BLOCK MANAGEMENT TABLE
DATA STRUCTURE OF AV BLOCK MANAGEMENT TABLE
x000 UNASSIGNED
x001 AV
x010 NON-AV
x011
~ RESERVED
x111
0xxx AV BLOCK NOT INCLUDING ZONE BOUNDARY
1xxx AV BLOCK INCLUDING ZONE BOUNDARY
ZONE 3
ZONE 4

FIG. 36A

PSEUDO CONSECUTIVE RECORD
ASSIGNMENT MANAGEMENT INFORMATION

6848	15983	0	e1
28000	31423	0	e2

FIG. 36B

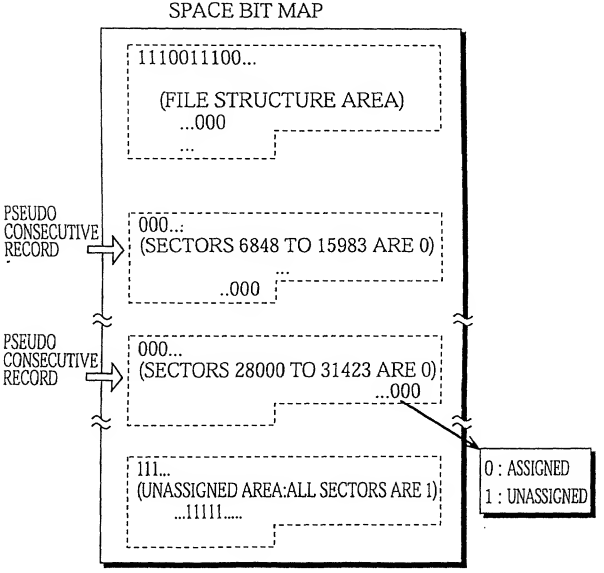


FIG. 37

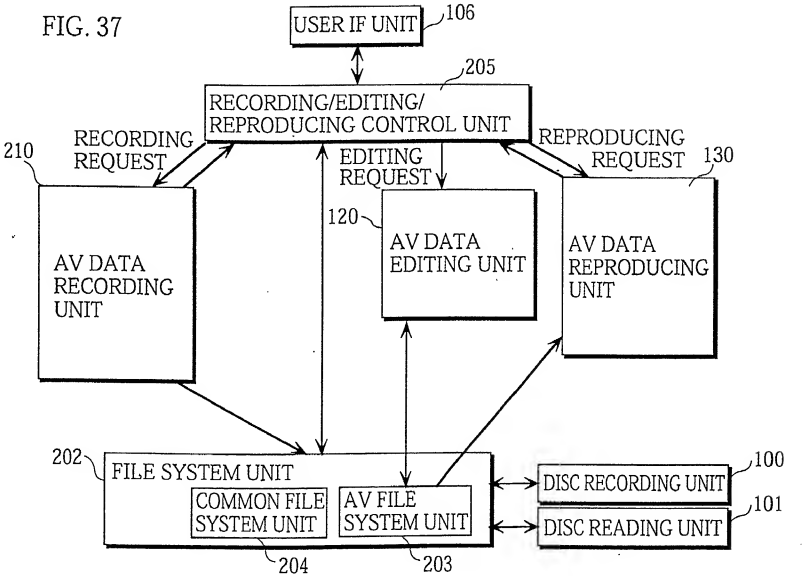

USER IF UNIT
106
205
RECORDING/EDITING/
REPRODUCING CONTROL UNIT
210
RECORDING
REQUEST
EDITING
REQUEST
REPRODUCING
REQUEST
130
120
AV DATA
RECORDING
UNIT
AV DATA
EDITING UNIT
AV DATA
REPRODUCING
UNIT
202
FILE SYSTEM UNIT
COMMON FILE
SYSTEM UNIT
AV FILE
SYSTEM UNIT
204
203
DISC RECORDING UNIT
100
DISC READING UNIT
101

FIG. 38

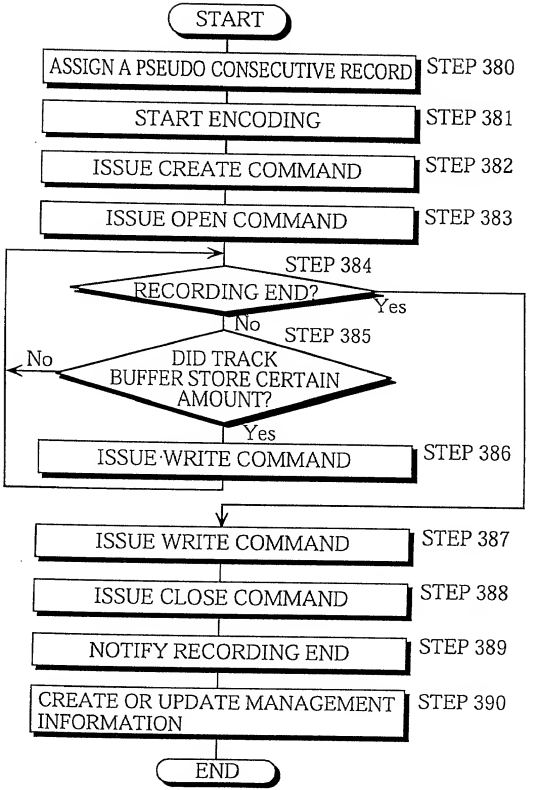

START
ASSIGN A PSEUDO CONSECUTIVE RECORD
STEP 380
START ENCODING
STEP 381
ISSUE CREATE COMMAND
STEP 382
ISSUE OPEN COMMAND
STEP 383
STEP 384
RECORDING END?
Yes
No
STEP 385
No
DID TRACK BUFFER STORE CERTAIN AMOUNT?
Yes
ISSUE WRITE COMMAND
STEP 386
ISSUE WRITE COMMAND
STEP 387
ISSUE CLOSE COMMAND
STEP 388
NOTIFY RECORDING END
STEP 389
CREATE OR UPDATE MANAGEMENT INFORMATION
STEP 390
END

FIG. 39A

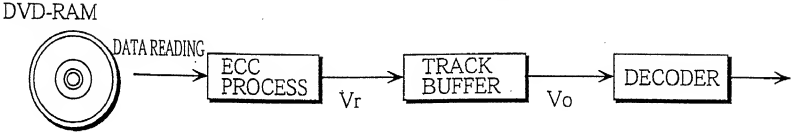


FIG. 39B

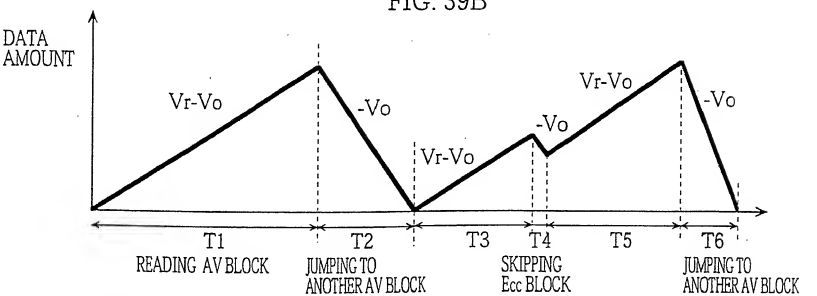


FIG. 40

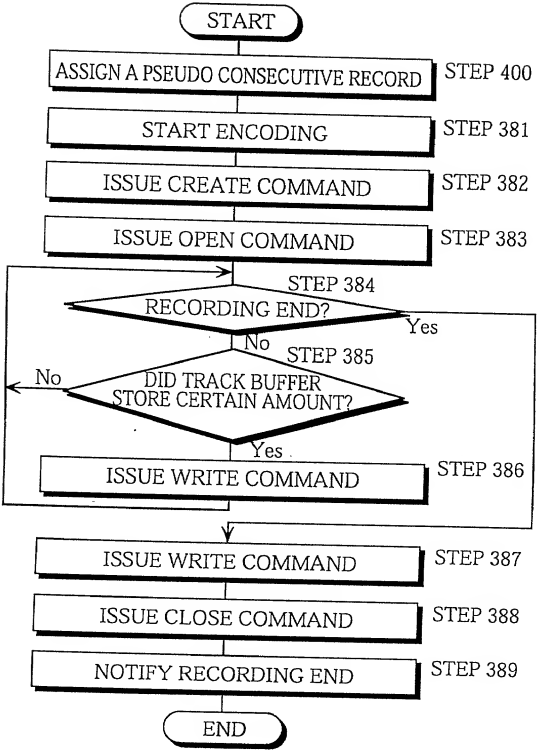
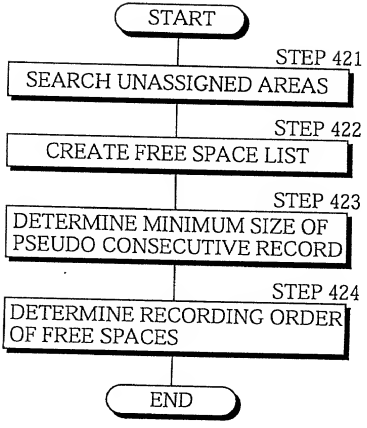


FIG. 41

START SECTOR	END SECTOR	ATTRIBUTE	
4900	6847	Free	c1
34848	39000	Free	c2
44000	48000	Free	c3

FIG. 42


START
STEP 421
SEARCH UNASSIGNED AREAS
STEP 422
CREATE FREE SPACE LIST
STEP 423
DETERMINE MINIMUM SIZE OF PSEUDO CONSECUTIVE RECORD
STEP 424
DETERMINE RECORDING ORDER OF FREE SPACES
END